[Document Name] Description

[Title of the Invention] Solid state image sensing device

[Claim(s)]

[Claim 1] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value The transmission control line which controls the gate of said transfer transistor, and the reset control line which controls the gate of said reset transistor are arranged in the 1st direction of two-dimensional procession arrangement of said unit pixel. The solid state image sensing device characterized by what is connected in the 2nd direction of two-dimensional procession arrangement whose output line connected to the source of the address control line which controls the drain voltage of said reset transistor, and said amplification transistor is said unit pixel.

[Claim 2] It is the solid state image sensing device according to claim 1 characterized by forming the signal line of said 1st direction with the 1st metal electrode, and forming the signal line of said 2nd direction with the 2nd metal electrode.

[Claim 3] The drain of said amplification transistor is a solid state image sensing device according to claim 1 characterized by connecting with the supply voltage line communalized among two or more pixels which consist of said 1st and 2nd metal electrode and the 3rd different metal electrode, and adjoin.

[Claim 4] Fix said address control line to an active level during a fixed period, then, impress the pulse of an active level to said reset transistor, and said electric charge detecting element is reset. Next, by impressing the pulse of an active level to said transfer transistor, transmitting the signal electric charge of said photoelectric transducer to said electric charge detecting element, and returning said address control line to a non active level The solid state image sensing device according to claim 1 characterized by having the mode of operation which reads the signal electric charge of said photoelectric transducer.

[Claim 5] After said address control line impresses the pulse of an active level to said reset transistor during the non active level and resets said electric charge detecting element The solid state image sensing device according to claim 4 characterized by having the mode of operation which resets the signal electric charge of said photoelectric transducer by returning said address control line to an active level.

[Claim 6] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value The solid state image sensing device characterized by what it has for the mode of operation which resets said electric charge detecting element on predetermined voltage by

changing said reset transistor into ON state for every horizontal-retrace period.

[Claim 7] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value It is arranged in the 1st direction of two-dimensional procession arrangement the transmission control line which controls the gate of said transfer transistor, and whose address control line which controls the drain of said reset transistor are said unit pixels. The solid state image sensing device characterized by what is connected in the 2nd direction of two-dimensional procession arrangement whose output line connected to the reset control line which controls the gate of said reset transistor, and the source of said amplification transistor is said unit pixel.

[Claim 8] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value The solid state image sensing device characterized by what common connection of the drain of said reset transistor and the drain of said amplification transistor is made for.

[Claim 9] It is the solid state image sensing device according to claim 8 characterized by forming the signal line of said 1st direction with the 1st metal electrode, and forming the signal line of said 2nd direction with the 2nd metal electrode.

[Claim 10] The solid state image sensing device according to claim 1 characterized by making common connection of the drain of the reset transistor of the unit pixel which adjoins in the direction of vertical scanning.

[Claim 11] The solid state image sensing device according to claim 7 characterized by making common connection of the drain of the reset transistor of the unit pixel which adjoins in the direction of vertical scanning.

[Claim 12] The solid state image sensing device according to claim 8 characterized by making common connection of the drain of the reset transistor of the unit pixel which adjoins in the direction of vertical scanning.

[Claim 13] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value The solid state image sensing device characterized by what some signal lines were communalized for by the unit pixel which adjoins in the direction of vertical scanning.

[Claim 14] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value The solid state image sensing device characterized by what some signal lines were communalized for by the unit pixel which adjoins a horizontal scanning direction.

[Claim 15] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value The solid state image sensing device characterized by what some signal lines were communalized for by the unit pixel which adjoins the direction of vertical scanning, and a horizontal scanning direction.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a thing effective in the solid state image sensing device using an amplified type MOS sensor for every unit pixel by which especially the two dimensional array was carried out about the solid state image sensing device used for various camera systems etc.

[0002]

[Description of the Prior Art] Conventionally, what is indicated by JP,H10-93066,A, for example is known as this kind of a solid state image sensing device. The photo diode which generates the signal electric charge according to the quantity of light of incidence light in this solid state image sensing device for each [by which the two dimensional array was carried out] unit pixel of every, The transmission (read-out) transistor which reads the signal electric charge generated with this photo diode, and is transmitted to an electric charge detecting element (FD; floating fusion part), [preparing the amplification transistor which outputs the electric

information corresponding to the potential fluctuation of an electric charge detecting element, and the reset transistor which resets the potential of an electric detecting element to a predetermined initial value, and constituting each pixel from three transistors] The element composition of each unit pixel is simplified and the miniaturization of a pixel etc. is attained. And the transmission control line which controls the gate of a transfer transistor by the above-mentioned conventional solid state image sensing device, The transverse direction (horizontal direction) of two-dimensional pixel arrangement is wired in the wiring of three of the address control line which controls the drain of a reset transistor, and the reset control line which controls the gate of a reset transistor. The lengthwise direction (perpendicular direction) is wired in the output line connected to the source of an amplification transistor.

[0003]

[Problem to be solved by the invention] However, when the layout of the above wiring is used, the size of the lengthwise direction of each unit pixel is influenced by the linewidth of wiring of three, and space width, and becomes difficult [it / to make a detailed pixel]. For this reason, since pixel size is influenced by a wiring pitch even if it reduces the number of the transistors of a unit pixel to three as mentioned above, it will be difficult to perform the miniaturization of a pixel. Thus, in the above-mentioned conventional solid state image sensing device, since restrictions of the pixel size by wiring became large even if it reduces the number of transistors, the layout of the pixel with the effective area product of enough photo diodes was difficult.

[0004] Then, the purpose of this invention improves the wiring layout which influences pixel size, can attain the miniaturization of a unit pixel, and there is in offering the solid state image sensing device which can be improved in the numerical aperture of a light sensing portion.

[0005]

[Means for solving problem] The photoelectric transducer which has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least in

order that this invention may attain said purpose, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value The transmission control line which controls the gate of said transfer transistor, and the reset control line which controls the gate of said reset transistor are arranged in the 1st direction of two-dimensional procession arrangement of said unit pixel. The output line connected to the source of the address control line which controls the drain voltage of said reset transistor, and said amplification transistor is characterized by connecting in the 2nd direction of the two-dimensional procession arrangement which is said unit pixel.

[0006] Moreover, the photoelectric transducer which this invention has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value By changing said reset transistor into ON state for every horizontal-retrace period, it is characterized by having the mode of operation which resets said electric charge detecting element on predetermined voltage.

[0007] Moreover, the photoelectric transducer which this invention has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value It is arranged in the 1st direction of two-dimensional procession arrangement the transmission control line which controls the gate of said transfer transistor,

and whose address control line which controls the drain of said reset transistor are said unit pixels. The output line connected to the reset control line which controls the gate of said reset transistor, and the source of said amplification transistor is characterized by connecting in the 2nd direction of the two-dimensional procession arrangement which is said unit pixel.

[0008] Moreover, the photoelectric transducer which this invention has the imaging region which has arranged two or more unit pixels by the two dimensional array, and generates the signal electric charge according to the quantity of light of incidence light to said unit pixel at least, The transfer transistor which reads the signal electric charge of said photoelectric transducer, and is transmitted to an electric charge detecting element, In the solid state image sensing device which prepared the amplification transistor which outputs the electric information corresponding to the potential fluctuation of said electric charge detecting element, and the reset transistor which resets the potential of said electric detecting element to a predetermined initial value It is characterized by making common connection of the drain of said reset transistor, and the drain of said amplification transistor.

[0009] [the solid state image sensing device of this invention / with the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor, and the reset transistor in each unit pixel] The transmission control line which controls the gate of a transfer transistor, and the reset control line which controls the gate of a reset transistor are arranged in the 1st direction of two-dimensional procession arrangement of a unit pixel. The output line connected to the source of the address control line which controls the drain voltage of a reset transistor, and an amplification transistor is connected in the 2nd direction of the two-dimensional procession arrangement which is a unit pixel. For this reason, since the wiring in each unit pixel can be distributed with sufficient balance in the direction of two dimensions, the influence of the wiring to pixel size can be eased, and the miniaturization of a unit pixel can be attained, and the numerical aperture of a light sensing portion can be improved.

[0010] [moreover, the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor, and the reset transistor in each unit pixel in the solid state image sensing device of this invention] By changing a reset transistor into ON state for every horizontal-retrace period, it has the mode of operation which resets said electric charge detecting element on predetermined voltage. For this reason, since an electric charge detecting element is resettable for every horizontal-retrace period, the influence of the leakage

current of an electric charge detecting element etc. can be prevented, the layout of each element or wiring becomes easy, and the miniaturization of that part and a unit pixel also becomes possible, and the numerical aperture of a light sensing portion can be improved.

[0011] [moreover, the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor, and the reset transistor in each unit pixel in the solid state image sensing device of this invention] It is arranged in the 1st direction of two-dimensional procession arrangement the transmission control line which controls the gate of a transfer transistor, and whose address control line which controls the drain of a reset transistor are unit pixels. The output line connected to the reset control line which controls the gate of a reset transistor, and the source of an amplification transistor is connected in the 2nd direction of the two-dimensional procession arrangement which is a unit pixel. For this reason, since the wiring in each unit pixel can be distributed with sufficient balance in the direction of two dimensions, the influence of the wiring to pixel size can be eased, and the miniaturization of a unit pixel can be attained, and the numerical aperture of a light sensing portion can be improved.

[0012] Furthermore, in the solid state image sensing device of this invention, common connection of the drain of a reset transistor and the drain of an amplification transistor is made with the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor, and the reset transistor in each unit pixel. For this reason, the number of wiring in a unit pixel can be reduced, the spaces of that part can be reduced, and the miniaturization of a unit pixel can be attained, and the numerical aperture of a light sensing portion can be improved.

[0013]

[Mode for carrying out the invention] The example of a form of operation of the solid state image sensing device by this invention is explained hereafter. In addition, in the following explanation, although the form of the operation explained below is the suitable example of this invention and desirable various limitation is attached technically, the range in particular of this invention shall not be limited to these modes, as long as there is no description of the purport that this invention is limited.

[0014] Drawing 1 is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 1st of this invention. The solid state image sensing device by the form of this operation has fundamentally the imaging region which has arranged two or more unit pixels by the two dimensional array like the conventional parallel (JP,H10-93066,A) mentioned above. Each unit pixel of this imaging region is scanned by perpendicularity and a horizontal scanning means, and a pixel signal is taken out from each unit pixel from an output line.

[0015] Each unit pixel of this solid state image sensing device And the photo diode 1 (1-1, 1-2, ...) as a photoelectric transducer, The transfer transistor 2 (2-1, 2-2, ...) which reads the signal electric charge of this photo diode 1, and is transmitted to the electric charge detecting element 5 (5-1, 5-2, ...), It has the amplification transistor 3 (3-1, 3-2, ...) which outputs an amplified voltage signal based on the potential fluctuation of the electric charge detecting element 5 by transmission of this electric charge, and the reset transistor 4 (4-1, 4-2, ...) which resets a photo diode 1. Moreover, the drive power supply 6 (6-1, 6-2, ...) is connected to the drain of the amplification transistor 3. In addition, the sign in the parenthesis of each element is a sign corresponding to each pixel. As signal wiring of each pixel, moreover, the transmission control line 8 (8-1, 8-2, ...) of the transfer transistor 2, The reset control line 9 (9-1, 9-2, ...) which controls the gate of the reset transistor 4, The drain wire 7 (7-1, 7-2, ...), the common drain control line (address control line) 10 (10-1, 10-2, ...), and the common perpendicular (output) signal line 11 (11-1, 11-2, ...) of the reset transistor 4 are prepared. In addition, the sign in the parenthesis of each line is each sequence or a sign corresponding to each line.

[0016] Next, in each pixel of such composition, the signal from a photo diode 1 is impressing the pulse of H (= active) level to the transmission signal line 8, and is read to the electric charge detecting element 5. In the electric charge detecting element 5, conversion to a voltage signal from a signal electric charge is performed, and a signal is transmitted to the perpendicular signal line 11 as change of voltage. In such pixel structure, the transmission control line 8 and the reset control line 9 are arranged horizontally (the 1st direction), and the address control line 10 and the perpendicular signal line 11 are arranged perpendicularly (the 2nd direction). Thus, the number of wiring per pixel also of a transverse direction and a lengthwise direction is two at a time.

[0017] Such arrangement becomes very effective, when enlarging area of a photo diode 1 and enlarging the amount of saturation signal electric charges. Moreover, since a transverse direction is formed with the 1st metal electrode (aluminum, copper, etc.), for example as for the wiring to a transverse direction and a lengthwise direction and the lengthwise direction is formed with the 2nd metal electrode (aluminum, copper, etc.), it enables it to make the resistance of an electrode small and to accelerate the drive of a pixel. In addition, although omitted in drawing 1, the 3rd metal wiring (aluminum, copper, etc.) is used as power supply wiring of the drive power supply 6.

[0018] Drawing 2 is a timing chart which shows the 1st drive method of the pixel in the form of this operation, and has indicated how to read a pixel signal. First, the address control line 10-1 (AddrA) is changed into a certain predetermined period"H" state. This address control line = between "H", a pulse is first impressed to the reset control line 9-1. Impression of this pulse will reset the potential of the electric charge detecting element 5 in the one where the voltage of the address control line 10 and the channel potential of the reset transistor 4 are lower. Next, a pulse is impressed to the read-out control line 8-1. Thereby, the signal electric charge of a photo diode 1 is read to the electric charge detecting element 5. Then, read-out operation is completed by making it address control line = "L." Since it is the method read for every line in this read-out, it reads with the reset control line 9-2 of the adjoining pixel, and the control line 8-2 is not driven. It drives at the next level blanking period.

[0019] Drawing 3 is a timing chart which shows the 2nd drive method of the pixel in the form of this operation. In addition, H5-H7 in a figure, and L5-L9 show specific H level value and specific L level value. Low level =L5 are large somewhat rather than the GND level to a different point from drawing 2 being H level =H5 of the address signal line 10-1 (AddrA). By doing in this way, it becomes possible to be efficient and to make the amplification transistor 3 into a non active state.

[0020] Drawing 4 is a timing chart which shows the 3rd drive method of the pixel in the form of this operation. A different point from drawing 3 is making potential of the electric charge detecting element 5 into the predetermined voltage VLow by making a Low period again on the address control line 10-1, and impressing a pulse to the reset control line 9-1 between them. Although it has become [that a signal electric charge is stored by the electric charge detecting

element 5 with as, and] in operation of drawing 3, since the electric charge detecting element 5 is reset immediately after read-out operation, a signal electric charge does not remain storing by drawing 4.

[0021] Drawing 5 is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 2nd of this invention. In addition, in the form of this operation, since the composition of each element in each pixel is common, it is explained to be the example of drawing 1 using the same sign. A different point from the example of drawing 1 is that arrangement formation of the read-out control line 14 and the address control line 15 is carried out horizontally, and arrangement formation of the reset control line 13-1 linked to the gate of a reset transistor and the perpendicular signal line 11-1 is carried out perpendicularly. Thereby, since the electric charge detecting element 5 is resettable for every horizontal-retrace period, it becomes possible to prevent the influence of the leakage current of the electric charge detecting element 5 etc.

[0022] This is a very effective means, when the leakage current of the electric charge detecting element 5 is large. Two are arranged to a transverse direction and each lengthwise direction, respectively, and this layout can also perform reduction-ization of the optimal pixel size to them. Moreover, since the layout of two transverse directions and two lengthwise directions is acquired because arrange the 1st metal wiring in a transverse direction and it arranges the 2nd metal wiring to a lengthwise direction, the high-speed drive of very few pixels of wiring delay of it is attained.

[0023] Drawing 6 is a timing chart which shows the 1st drive method of the pixel in the form of this operation, and has indicated how to read a pixel signal. First, the address control line 15-1 is made into a certain predetermined period"H". A pulse is impressed to the reset control line 13-1, and the electric charge detecting element 5 is reset in this period. Then, the signal of a photo diode 1 is read by impressing a pulse to the read-out control line 14-1. And after a series of operation of read-out is completed, the address control line 15-1 is set to Low, and a pulse is again impressed to the reset control line 13-1. The electric charge detecting element 5 is resettable on the predetermined voltage Vaddr with this.

[0024] Drawing 7 is a timing chart which shows the 2nd drive method of the pixel in the form of

this operation. In addition, H1-H4 in a figure, and L1-L3 show specific H level value and specific L level value. The Low level of the address control line 15-1 is L1, and a different point from drawing 6 is large a little rather than the GND level. By doing in this way, the leakage current components which flow into a photo diode 1 conversely from the electric charge detecting element 5 are reducible.

[0025] Drawing 8 is a timing chart which shows the 3rd drive method of the pixel in the form of this operation. This method sets voltage by the side of Low of the address control line 15-1 to "VL1" which is voltage higher than GND=0V, and is setting voltage by the side of Low of the read-out control line 14-1 to "VL2." A voltage setup of VL1 can prevent current from the electric charge detecting element 5 from flowing into a photo diode 1 through the transfer transistor 2. Moreover, the same effect as a voltage setup by VL1 can be acquired by voltage setup of VL2. In addition, a voltage setup of VL1 and VL2 may apply both like the example shown in drawing 8, and may apply only one of the two.

[0026] Drawing 9 is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 3rd of this invention. In addition, in the form of this operation, except for the drive power supply 6 and connection structure, since the composition in each pixel is common, it is explained to be the example of drawing 1 and drawing 5 using the same sign. A different point from drawing 1 mentioned above and the pixel constitution shown in drawing 5 is a point that the source end child of the drain of the reset transistor 4 and the amplification transistor 3 is connected to the common source wiring 16 (16-1, 16-2, ...). This common wiring 16 is connected to the power control line 17 (17-1, 17-2, ...) arranged in the lengthwise direction. According to such a layout, a pixel can be operated only by two metal wiring, the control lines 19 (19-1, 19-2, ...) and 20 (20-1, 20-2, ...) of a transverse direction, and the control lines 17 and 18 of a lengthwise direction. That is, with the composition shown in drawing 1 and drawing 5, although the 3rd needed to be metal wired as power supply wiring, by this example, it becomes unnecessary.

[0027] Drawing 10 is a timing chart which shows the 1st drive method of the pixel in the form of this operation, and shows operation at the time of signal read-out. First, it is set to a predetermined period H level (active) with the power control line 17-1 (Act1). Since a pulse signal is impressed to the reset control line 20, the electric charge detecting element 5 (it omits in drawing 10) is reset by predetermined voltage in the meantime. Then, a pulse is impressed

to the read-out control line 19-1. By this, the signal electric charge of a photo diode 1 (it omits in drawing 10) can be read to the electric charge detecting element 5. Then, by making the power control line 17-1 into L level, and impressing a pulse signal to the reset control line 20-1 again, the electric charge detecting element 5 can be made into a GND level, the amplification transistor 3 can be made into an OFF state, and the pixel of this sequence can be made into a non active state.

[0028] Drawing 11 is a timing chart which shows the 2nd drive method of the pixel in the form of this operation. In this example, the voltage by the side of Low of the power control line 17-1 is VL10>GND=0V. Thereby, as the above-mentioned example explained, it can protect that current flows into a photo diode 1 through the transfer transistor 2 from the electric charge detecting element 5.

[0029] Drawing 12 is a timing chart which shows the 3rd drive method of the pixel in the form of this operation. In this example, it differs from the example of drawing 11 that the Low voltage of the read-out control line 19-1 is set to VL11 (<GND=0V), and the Low voltage of the reset control line 20-1 has become VL12 (<GND=0V). In addition, although adoption of VL11 has the same effect as the method explained by drawing 11, adoption of VL12 has the effect as for which the reset transistor 4 is completely made to an OFF state.

[0030] Drawing 13 is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 4th of this invention, and shows the vertical and horizontal composition for 4 pixels. Each unit pixel of the solid state image sensing device twisted to this example A photo diode 1 (1-1-1, 1-2-1, 1-1-2, 1-2-2, ...), The transfer transistor 2 (2-1-1, 2-2-1, 2-1-2, 2-2-2, ...), The amplification transistor 3 (3-1-1, 3-2-1, 3-1-2, 3-2-2, ...), It has the reset transistor 4 (4-1-1, 4-2-1, 4-1-2, 4-2-2, ...), the electric charge detecting element 5 (5-1-1, 5-2-1, 5-1-2, 5-2-2, ...), and the drive power supply 6 (6-1-1, 6-2-1, 6-1-2, 6-2-2, ...). Moreover, as signal wiring of each unit pixel, the transmission control line 24 (24-1, 24-2, ...) and the reset control line 25 (25-1, 25-2, ...) are formed in a transverse direction. The common drain control line (common source line) 22 (22-1, 22-2, ...) and the common perpendicular (output) signal line 23 (23-1, 23-2, ...) are formed in the lengthwise direction.

[0031] [and two pixels which the drain terminal of the reset transistor 4 (4-1-1, 4-1-2, 4-2-1, 4-2-2, ...) adjoins the upper and lower sides (the direction of vertical scanning), and are arranged in the solid state image sensing device of this example] It is the common wiring 21 (21-1-1, 21-1-2, 21-2-1, 21-2-2, ...), and connects with the common source line 22 (22-1, 22-2, ...). The number of contacts can be made to reduce by one piece by two up-and-down pixels according to such a layout structure. In addition, since other composition is the same as that of the form of operation mentioned above, explanation is omitted.

[0032] Drawing 14 is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 5th of this invention, and shows the vertical and horizontal composition for 4 pixels. Each unit pixel of the solid state image sensing device twisted to this example A photo diode 1 (1-1-1, 1-2-1, 1-1-2, 1-2-2, ...), The transfer transistor 2 (2-1-1, 2-2-1, 2-1-2, 2-2-2, ...), The amplification transistor 3 (3-1-1, 3-2-1, 3-1-2, 3-2-2, ...), It has the reset transistor 4 (4-1-1, 4-2-1, 4-1-2, 4-2-2, ...), the electric charge detecting element 5 (5-1-1, 5-2-1, 5-1-2, 5-2-2, ...), and the drive power supply 6 (6-1-1, 6-2-1, 6-1-2, 6-2-2, ...). Moreover, as signal wiring of each unit pixel, the transmission control line 24 (24-1, 24-2, ...) and the reset control line 25 (25-1, 25-2, ...) are formed in a transverse direction. The common drain control line (common source line) 22 (22-1, 22-2, ...) and the common perpendicular (output) signal line 23 (23-1, 23-2, ...) are formed in the lengthwise direction.

[0033] In the solid state image sensing device of this example, and the drain wire 21 (21-1-1, 21-1-2, ...) of the reset transistor 4, The drain wire 27 (27-1-1, 27-1-2, ...) of the amplification transistor 3 (3-1-1, 3-1-2, 3-2-1, 3-2-2, ...) is carried out in common by the up-and-down pixel. And the drain wire 21 (21-1-1, 21-1-2, ...) of the reset transistor 4 is connected to the common source line 22 (22-1, 22-2, ...) by the common wiring 26 (26-1-1, 26-1-2, ...). Moreover, the drive power supply 6 (6-1, 6-2, ...) is connected to the drain wire 27 (27-1-1, 27-1-2, ...) of the amplification transistor 3 (3-1-1, 3-1-2, 3-2-1, 3-2-2, ...). The number of contacts can be made to reduce by two pieces by two up-and-down pixels according to such a layout structure. In addition, since other composition is the same as that of the form of operation mentioned above, explanation is omitted.

[0034] Drawing 15 is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 6th of this invention. It has become

symmetrical [the circuit structure of each pixel], and drawing 15 shows the composition of a part of vertical and horizontal 4 pixels and the vertical and horizontal circumference pixel of those. Each unit pixel of the solid state image sensing device twisted to this example A photo diode 1 (1-1-1, 1-1-2, 1-1-3, 1-1-4, 1-2-1, 1-2-2, 1-2-3, 1-2-4, ...), The transfer transistor 2 (2-1-1, 2-1-2, 2-1-3, 2-1-4, 2-2-1, 2-2-2, 2-2-3, 2-2-4, ...), The amplification transistor 3 (3-1-1, 3-1-2, 3-1-3, 3-1-4, 3-2-1, 3-2-2, 3-2-3, 3-2-4, ...), The reset transistor 4 (4-1-1, 4-1-2, 4-1-3, 4-1-4, 4-2-1, 4-2-2, 4-2-3, 4-2-4, ...), It has the electric charge detecting element 5 (5-1-1, 5-1-2, 5-1-3, 5-1-4, 5-2-1, 5-2-2, 5-2-3, 5-2-4, ...). Moreover, as signal wiring of each unit pixel, the transmission control line 24 (24-1, 24-2, ...) and the reset control line 25 (25-1, 25-2, ...) are formed in a transverse direction. The common source control line 28 (28-1, 28-2, ...) and the common perpendicular (output) signal line 29 (29-1, 29-2, ...) are formed in the lengthwise direction.

[0035] And the drain of the amplification transistor 3 is connected to the common power control line 28 (28-1, 28-1, ...) through contact 30 (30-1-1, 30-1-2, 30-2-1, 30-2-2, ...). This power control line 28 is common by two pixels on either side, and it is possible to reduce the number of contacts and the number of wiring of a lengthwise direction. Moreover, the drain of the reset transistor 4 is also connected to the common power control line 28 through contact 31 (31-1-1, 31-2-1, ...). This can also reduce the number of contacts.

[0036] In addition, in drawing 15, the power supply contact 30 of an amplification transistor and the control line contact 31 of the reset transistor were communalized, and it has connected with the power control line 28. However, it is possible to connect the power supply contact 30 and the control line contact 31 by the 3rd metal wiring, and to serve as shading of a photo diode 1 by this 3rd metal wiring further. By doing in this way, it is possible to raise the flexibility of a layout further.

[0037] Although not shown by a diagram, at least Moreover, a photoelectric transducer (photo diode), The transfer transistor which reads the signal of a photoelectric transducer, and the electric charge detecting element for transforming a signal electric charge into electric information, It is possible to communalize right and left and the upper and lower sides by two or more pixels as mentioned above by the pixel by which this electric charge detecting element has the amplification transistor connected to the gate and a reset transistor with the function to set the signal of an electric charge detecting element as a certain initial value. It is possible to

communalize the arrangement of a pixel by 2x2, 2x4, 2x8, etc., and to develop a miniaturized pixel especially in the solid state image sensing device which has arranged the colored filter, corresponding to 1 set of color arrangement.

[0038] Moreover, although the example with three transistors and one photo diode is shown on Drawings, it is possible to apply to this invention similarly with four or more transistors and two or more photo diodes. An important point is adopting the control line of a lengthwise direction, and is a point which becomes possible [miniaturizing without making the number of wiring increase to a transverse direction] here. Furthermore, this invention can be applied not only to the solid state image sensing device of the above structures but to various kinds of solid state image sensing devices, and is effective technology in an especially miniaturized pixel.

[0039]

[Effect of the Invention] [according to the solid state image sensing device of this invention / the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor and the reset transistor in each unit pixel] as explained above The transmission control line which controls the gate of a transfer transistor, and the reset control line which controls the gate of a reset transistor are arranged in the 1st direction of two-dimensional procession arrangement of a unit pixel. [connect / in the 2nd direction of the two-dimensional procession arrangement which is a unit pixel / the output line connected to the source of the address control line which controls the drain voltage of a reset transistor, and an amplification transistor] Since the wiring in each unit pixel can be distributed with sufficient balance in the direction of two dimensions, the influence of the wiring to pixel size can be eased, and the miniaturization of a unit pixel can be attained, and the numerical aperture of a light sensing portion can be improved.

[0040] [moreover, the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor, and the reset transistor in each unit pixel according to the solid state image sensing device of this invention] Since it has the mode of operation which resets said electric charge detecting element on predetermined voltage by changing a reset transistor into ON state for every horizontal-retrace period and an electric charge detecting element is resettable for every horizontal-retrace period The influence of the leakage

current of an electric charge detecting element etc. can be prevented, the layout of each element or wiring becomes easy, and the miniaturization of the part and a unit pixel also becomes possible, and the numerical aperture of a light sensing portion can be improved.

[0041] [moreover, the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor, and the reset transistor in each unit pixel according to the solid state image sensing device of this invention] It is arranged in the 1st direction of two-dimensional procession arrangement the transmission control line which controls the gate of a transfer transistor, and whose address control line which controls the drain of a reset transistor are unit pixels. [connect / in the 2nd direction of the two-dimensional procession arrangement which is a unit pixel / the output line connected to the reset control line which controls the gate of a reset transistor, and the source of an amplification transistor] Since the wiring in each unit pixel can be distributed with sufficient balance in the direction of two dimensions, the influence of the wiring to pixel size can be eased, and the miniaturization of a unit pixel can be attained, and the numerical aperture of a light sensing portion can be improved.

[0042] [moreover, the composition which prepared the photoelectric transducer, the transfer transistor, the amplification transistor, and the reset transistor in each unit pixel according to the solid state image sensing device of this invention] Since common connection of the drain of a reset transistor and the drain of an amplification transistor is made, the number of wiring in a unit pixel can be reduced, the spaces of the part can be reduced, and the miniaturization of a unit pixel can be attained, and the numerical aperture of a light sensing portion can be improved.

[Brief Description of the Drawings]

[Drawing 1] It is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 1st of this invention.

[Drawing 2] It is the timing chart which shows the 1st drive method in the unit pixel of the solid state image sensing device shown in drawing 1.

[Drawing 3] It is the timing chart which shows the 2nd drive method in the unit pixel of the solid state image sensing device shown in drawing 1.

[Drawing 4] It is the timing chart which shows the 3rd drive method in the unit pixel of the solid state image sensing device shown in drawing 1.

[Drawing 5] It is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 2nd of this invention.

[Drawing 6] It is the timing chart which shows the 1st drive method in the unit pixel of the solid state image sensing device shown in drawing 5.

[Drawing 7] It is the timing chart which shows the 2nd drive method in the unit pixel of the solid state image sensing device shown in drawing 5.

[Drawing 8] It is the timing chart which shows the 3rd drive method in the unit pixel of the solid state image sensing device shown in drawing 5.

[Drawing 9] It is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 3rd of this invention.

[Drawing 10] It is the timing chart which shows the 1st drive method in the unit pixel of the solid state image sensing device shown in drawing 9.

[Drawing 11] It is the timing chart which shows the 2nd drive method in the unit pixel of the solid state image sensing device shown in drawing 9.

[Drawing 12] It is the timing chart which shows the 3rd drive method in the unit pixel of the solid state image sensing device shown in drawing 9.

[Drawing 13] It is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 4th of this invention.

[Drawing 14] It is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 5th of this invention.

[Drawing 15] It is the circuit diagram showing the equal circuit of the unit pixel of the solid state image sensing device by the form of operation of the 6th of this invention.

[Explanations of letters or numerals] 1 .... A photo diode, 2 .... A transfer transistor, 3 .... Amplification transistor, 4 [.... A reset drain line, 8 / .... A transmission control line, 9 / .... A reset control line, 10 / .... A common drain control line, 11 / .... Common perpendicular (output) signal line.] .... A reset transistor, 5 .... An electric charge detecting element, 6 .... A drive power supply, 7

[Translation done.]